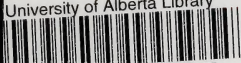


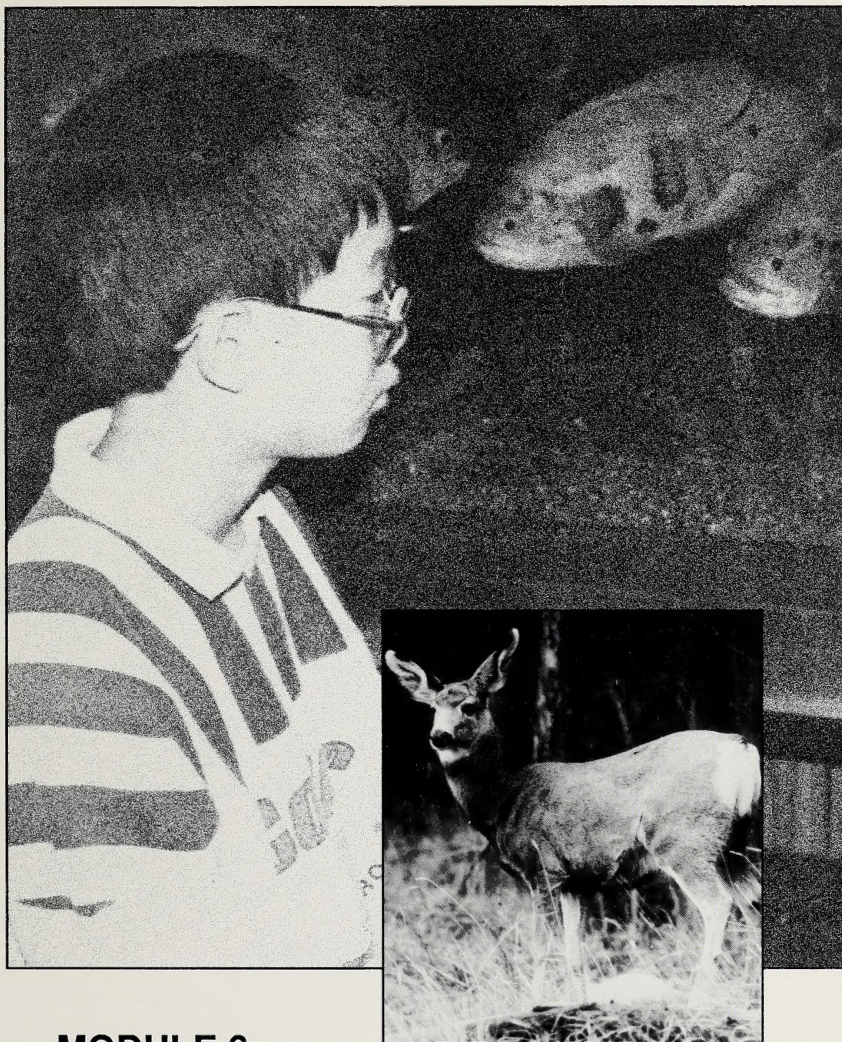
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MODULE 6: Interactions and Environments STUDENT SUPPORT GUIDE



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Science 8

Module 6

STUDENT SUPPORT GUIDE



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Note to the Parent or Guardian

This Science Student Support Guide contains answers to activities in the accompanying Module Booklet. It should be kept secure by the parent or guardian if the student is under 16 years of age. Younger students should not have access to this Guide except under supervision.

This Student Support Guide does not contain the answers to the accompanying Assignment Booklet. The Assignment Booklet will be graded by the student's distance education teacher.

Science 8
Student Support Guide
Module 6
Interactions and Environments
Alberta Distance Learning Centre
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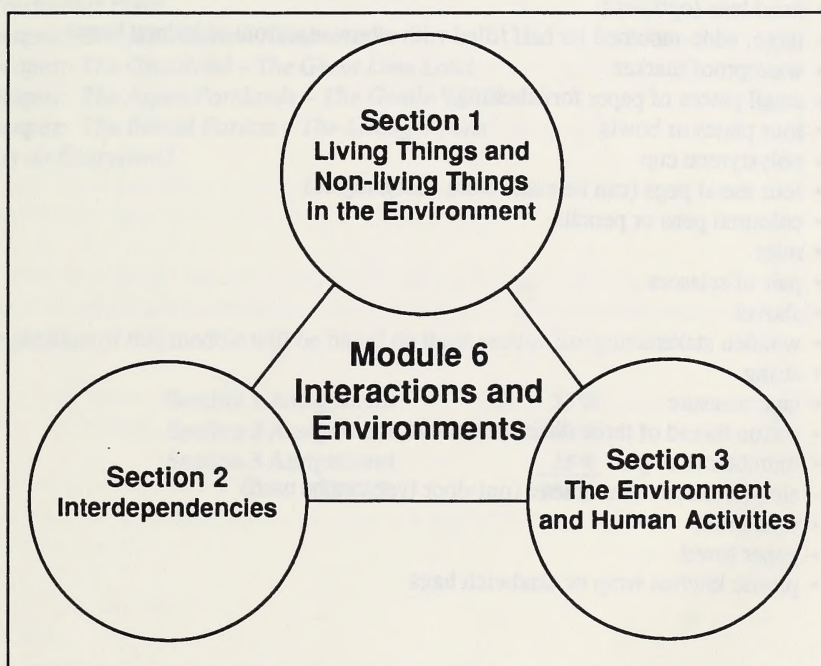
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Module 6 – Interactions and Environments: Overview

The major emphasis of this module is the nature of science.

This module is a study of living things within their environments. Interactions among living things and the significance of abiotic parts of the environment are studied. The module concludes with an examination of some of the effects of human activities on environmental quality.



Moving Through the Module

In this module Section 3, Activity 3 must be completed over a number of days because it involves the growing of mould. In order to facilitate student progress, the student can work on this activity concurrently with other activities.

There are very few words defined in the margin of the student module booklet. Most new vocabulary words are introduced in textbook readings and do not appear in the margin. However, the glossary in the appendix contains all the important new words of this module.

Materials and Equipment

The following materials and equipment will be needed:

- slices of bread
- sheet of thick cardboard measuring about 30 cm by 30 cm
- dust cloth
- elastic or tape
- glue
- hammer
- hand lens (optional)
- large, wide-mouthed jar half filled with elbow macaroni or kidney beans
- waterproof marker
- small pieces of paper for labelling
- four plates or bowls
- polystyrene cup
- four metal pegs (can be made from coat hangers)
- coloured pens or pencils
- ruler
- pair of scissors
- shovel
- wooden stake
- string
- tape measure
- cotton thread of three different colours
- thumbtacks or pins
- alcohol-filled thermometer (out-door type can be used)
- toothpicks
- paper towel
- plastic kitchen wrap or sandwich bags

Media

Video cassettes may be available from your local school jurisdiction or from the Alberta Distance Learning Centre – Junior High Department.

The following videos are not included in the pathways within this module but may be found useful:

Backyard Bugs

The Desert Ecosystem

The Forest Ecosystem

The Freshwater Pond

Landscapes: The Mountains – Headwaters

Landscapes: The Grassland – The Great Lone Land

Landscapes: The Aspen Parklands – The Gentle Wilderness

Landscapes: The Boreal Forests – The Strong Woods

What Is an Ecosystem?

Evaluation

The evaluation of this module will be based on three section assignments.

Section 1 Assignment	33%
Section 2 Assignment	42%
Section 3 Assignment	25%
TOTAL	100%

Section 1: Living Things and Non-living Things in the Environment

Section 1: Activity 1

A hand lens, although not required, would be useful for this activity.

1. What are the biotic parts of the environment?

The biotic parts are the living parts of the environment consisting of plants, animals, and micro-organisms.

2. What are the non-living parts of the environment called?

The non-living parts are called abiotic parts.

3. Do question 1 (a) on page 287 of your textbook.

Biotic components of a pond include grebes, bulrushes, pond weeds, algae, ducks, muskrats, and frogs (not all visible in the photo). Some abiotic components are water, mud, air, and light.

Comment: The student is to identify living and non-living things in a backyard or another area that you consider safe. Be prepared to approve an area that the student can work in.

4. Using Activity 6-1 on pages 276 and 277 of *Science Directions 8* as your guide, do the following from that activity.

Procedure

Textbook question 1:

Answers will vary. The student may list grass, dandelions, roses, ants, pine trees, sparrows, and poplars.

Textbook questions 3. (a) and 3. (b):

Answers will vary since different areas are being surveyed. In the column labelled Biotic, only living things should appear. In the column labelled Abiotic, only factors involving non-living things should appear.

Finding Out

Textbook question 1:

Answers will vary. Living things not listed in Procedure question 1 but listed under Biotic in Procedure question 3 should be listed here. This question is to stimulate an evaluation of the prediction.

5. Tell how one of the abiotic parts affects a biotic part of your backyard.

Answers will vary. The student may observe that grass grows poorly on the hot, dry, south side of a building. Grass also does poorly under large spruce trees. Aphids may be found near certain kinds of hedges. Moss may grow on the sidewalk on the cool, damp, north side of a house.

6. Pick a biotic part of your backyard that you would like to improve. How would you change your backyard to provide it with a better environment.

Answers will vary. The student may suggest more water for grass, trees for birds, a pond for fish, and fertilizer for flowers. This question is designed to increase awareness of the relationships between parts of the environment.

Section 1: Activity 2

The following are needed for this activity:

- elastic or tape
- a hammer
- a polystyrene cup
- a shovel
- a wooden stake about one metre in length
- string
- an alcohol-filled thermometer

An outdoor thermometer may be used. It can be obtained from a hardware store. A mechanical type of thermometer is not suitable.

1. Using the expression *range of tolerance* explain why a fern may die where a cactus can survive.

In a hot, dry location, the temperature and humidity may be within the range of tolerance for the cactus. At the same time, the temperature and humidity may be above the range of tolerance for the fern.

2. Record your results in the table.

Answers will vary depending on the location and the day on which temperature measurements are made. The temperature should be warmest at ground level and coolest below the ground.

Height	Temperature
30 cm above ground	20°C
ground-level	29°C
30 cm below ground	9°C

3. At a suitable spot, record wind speeds at the heights indicated in the table. Pick a spot with low ground cover. Enter your results.

Answers will vary depending, in part, on whether the day is windy.

Height	Wind Speed
2 m	<i>moderate</i>
1 m	<i>low</i>
ground level	<i>low</i>

4. Enter your results in the table.

Answers will vary. General weather conditions will influence soil moisture.

Location	Soil Moisture
<i>south-side of house</i>	<i>dry</i>
<i>north-side of garage</i>	<i>very moist</i>

5. Enter your results in the table.

Answers will vary depending on the weather and the area being used.

Location	Brightness
<i>under the apple tree</i>	<i>shade</i>
<i>middle of lawn</i>	<i>sunny</i>

6. Pick your own test location and describe the abiotic factors of wind speed, brightness, temperature, and soil moisture that apply to it. Your test area could be in a shrub or under a rock, for example.

Answers will vary. Abiotic factors should be described for the test location chosen by the student. General weather conditions affect measurements. Under a rock, there is no wind speed, it is dark, the temperature is 12°C, and it is moist.

In a shrub, the wind speed is low, the light is shady, the temperature is 25°C, and soil moisture doesn't apply.

7. Give an example of how abiotic factors affect the growth of plants or animals in the area you studied.

Answers will vary. The student may observe that grass grows poorly on the sunny, south side of buildings where it is hot and dry. Ferns grow well on the north side of the house where the soil is moist, the light is shady, and the air is cool. Flowering plants, such as petunias, grow well where the soil is moist, the temperature is warm, and the sun is moderate.

8. Make a table to compare these factors for area A and area B on the map.

	Area A	Area B
Annual hours of sunshine	<i>more than 2200 h</i>	<i>1800 - 2200 h</i>
Annual precipitation	<i>300 mm - 500 mm</i>	<i>500 mm - 800 mm</i>
General soil type	<i>dry-climate</i>	<i>wet-climate</i>

9. Do question 1 of Finding Out on page 279 of your textbook.

You can only identify general trends between abiotic factors and types of vegetation on the map.

Textbook question 1. (a):

Grassland and parkland grow in the most amount of sunlight.

Textbook question 1. (b):

Boreal forest grows in the least amount of sunlight.

Textbook question 1. (c):

Boreal forest and parkland grow with the most amount of precipitation.

Textbook question 1. (d):

Grassland and parkland grow with the least amount of precipitation.

Textbook question 1. (e):

All types of vegetation grow in dry-climate soils.

Textbook question 1. (f):

Boreal forest grows in wet-climate soils.

10. Corn needs plenty of sunshine in order to grow well. Suppose you wanted to buy farmland in Alberta in order to start a corn farm. Where would you obtain the land – near Taber or in the Peace River area? Tell why. (You may need to use a map of Alberta to find these places.)

Land near Taber would be more suitable for corn since it gets more sunshine – more than 2200 h/year compared to 1800-2200 h/year in the Peace River area.

Section 1: Activity 3

For this activity four metal pegs, a tape measure, and some string will be needed.

The student will be estimating the number of dandelions in a rectangular area of lawn. You are to designate a suitable area for this. Also, the student is to toss pegs in order to more randomly select samples. The pegs are to be handled with caution and not thrown anywhere near other people.

If there are no dandelions to count, direct the student to count some other lawn weed such as clover or plantain that is easily seen.

1. Give some reasons for wanting to know the population sizes of organisms.

You may want to know population sizes in order to

- *predict the population of hawks from the population of their prey*
- *determine the amount of lumber that can be harvested from the number of trees*
- *estimate the crop loss due to grasshopper population*

The student may have given other reasons too.

2. Ecologists count organisms within small *samples* in order to estimate the population size.

3. Use the following space to record the numbers of dandelions in the quadrats.

Answers will vary.

<i>Quadrat 1</i>	<i>Quadrat 2</i>	<i>Quadrat 3</i>	<i>Quadrat 4</i>
10	14	16	8

4. Calculate the average number of dandelions in the quadrats.

Answers will vary.

The average is $\frac{10 + 14 + 16 + 8}{4} = 12$.

5. What is your estimate of the dandelion population in the lawn?

Answers will vary.

$$A = l \times w = 10 \text{ m} \times 7 \text{ m} = 70 \text{ m}^2.$$

The number of dandelions is

$$12 \text{ dandelions} \times 70 = 840 \text{ dandelions}.$$

6. Do the following from Finding Out on page 305 of your textbook.

Textbook question 1:

If quadrats were not chosen randomly, you might more easily pick several with a higher or lower than average number of dandelions. The estimate would then be either too high or too low.

Textbook question 2:

Accuracy can be improved by using more quadrats.

Section 1: Activity 4

For this activity a large, wide-mouthed jar (with a lid) half-filled with elbow macaroni or kidney beans is needed. A water-proof marker is also required.

1. What sampling method can be used in areas having trees and bushes?

The line transect method can be used.

2. Do the following questions from Finding Out on page 306 of your textbook.

Textbook question 1:

Plant A was most common and plant B was least common.

Textbook question 3:

The two most common plants, plants A and C, grew on the same part of the slope. There are four intervals having both plants.

3. Large animals that gather in groups can be *photographed* in order to count them. Another method, used to estimate populations of small animals, is the *mark-recapture* method.
4. Suppose that you counted grasshoppers in a field. One morning you collected seventy-five grasshoppers. You marked them and then released them. In the afternoon you collected sixty grasshoppers. You found that twelve of the grasshoppers were marked. Assume that the grasshoppers were confined to the field. What do you estimate the grasshopper population size to be? Show your calculations.

On day 2 you found that twelve out of sixty, or one-fifth, of the population had been marked. You could infer that seventy-five grasshoppers collected on day 1 represented one-fifth of the population. The total population must be $75 \text{ grasshoppers} \times 5 = 375 \text{ grasshoppers}$.

You could also use the formula to determine the total population.

$$\frac{75}{gh} = \frac{12}{60}, \text{ so } gh \times 12 = 75 \times 60.$$

$$\text{Therefore, } gh = \frac{75 \times 60}{12} = 75 \times 5 = 375.$$

The total population must be 375 grasshoppers.

5. What is given as the problem?

The problem is How can you estimate the population of beans in a jar?

6. Record your estimate based on your observations.

Answers will vary.

There are 700 beans in the jar.

7. Tell what you will do to estimate the bean population using the mark-recapture method.

Answers will be similar to this: I'm going to take out a handful of beans. I'll count this sample and mark the beans. Then I'll return this sample to the jar. I'll then mix the beans thoroughly by shaking the jar. Then I'll take out another handful of beans to determine the ratio of marked to unmarked beans. I'll then determine the number of beans by following the calculations for the mark-recapture method.

8. What is your estimate of the bean population using the mark-recapture method? Show your work.

Answers will vary.

Suppose there were 48 beans in the first handful. These beans were marked and returned to the jar. After mixing the beans, the second handful contained 51 beans of which four were marked. The calculations using the formula would be as follows:

$$\frac{48}{\text{beans}} = \frac{4}{51}$$

$$\text{beans} \times 4 = 48 \times 51$$

$$\text{beans} = \frac{48 \times 51}{4} = 612$$

There are 612 beans in the jar.

9. How many beans were actually in the jar?

Answers will vary.

One response may be that there were 630 beans in the jar.

10. How accurate was the mark-recapture method?

The mark-recapture method estimate should be surprisingly close to the actual number of beans. It is generally much better than an estimate based on just observation.

11. How could you increase the accuracy of your estimate?

The mark-recapture procedure could be repeated several times. Then the estimate could be based on the average. Or, the sample sizes could be increased.

12. Do question 3 of Finding Out of Activity 6-9 on page 308 of your textbook.

Possible responses:

- Populations can move during sampling, so the marked animals are under-represented in the second sample.*
- The marked animals may be the ones more easily caught, so they are over-represented in the second sample.*
- The marked samples may be more easily seen by predators, so they are under-represented in the second sample.*

Section 1: Activity 5

1. Write a few sentences you would use to describe your home to a friend.

Answers will vary. This question is to get students to relate this activity to their personal lives.

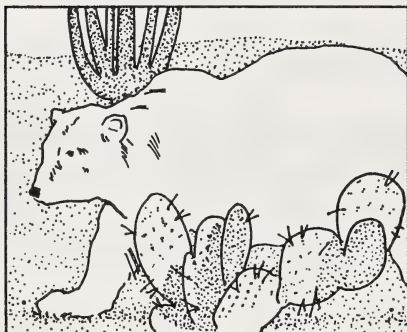
A possible response: I live with my parents in a three-bedroom apartment. It is on the third floor of a five-storey building. I have my own bedroom which has a window overlooking a park. My bedroom has light-blue wallpaper and wall-to-wall carpet.

2. The largest ecosystem on Earth is the *biosphere*.

3. Give one example of how one part of the biosphere can affect another part far away.

The student may give other examples but three are given in the reading:

- *Oxygen comes from tropical rainforests and from life in the ocean.*
- *Dust and gases from a volcano are carried world-wide.*
- *Seeds are carried from one continent to another by migrating birds.*



4. Tell why the two pictures appear to be incorrect.

The polar bear and snake should take each other's place; the polar bear belongs in the cold environment and the snake in the warm one.

5. List the forest biomes.

The forest biomes are the following:

- *northern coniferous forest*
- *temperate deciduous forest*
- *temperate rain forest*
- *tropical rain forest*
- *tropical deciduous forest*

6. Why do the biomes change as you move away from the equator?

The climate gets colder and drier away from the equator.

7. Name two biomes of Alberta.

Northern coniferous forest and grassland are biomes of Alberta.

8. How does a micro-environment differ from a habitat?

When you compare a micro-environment to a habitat, you can say a micro-environment is smaller and has more uniform abiotic conditions. Usually the abiotic conditions of a micro-environment are different from its surrounding habitat.

Section 1: Follow-up Activities

Extra Help

1. Name four abiotic factors.

Soil moisture, light brightness, wind speed, temperature, annual precipitation, annual hours of sunshine, and humidity are abiotic factors.

2. What method would you use to determine the size of a herd of caribou?

The caribou can be counted from aerial photographs of the herd.

3. When would you use the mark-recapture method to determine a population size?

You can use the mark-recapture method for small animals when you cannot see the whole population at the same time, e.g., for grasshoppers or for fish in a lake.

4. Match the expressions in the left column with the words in the right column.

 C a. a pond

A. biome

 D b. bottom of a pond

B. biosphere

 B c. the largest ecosystem

C. habitat

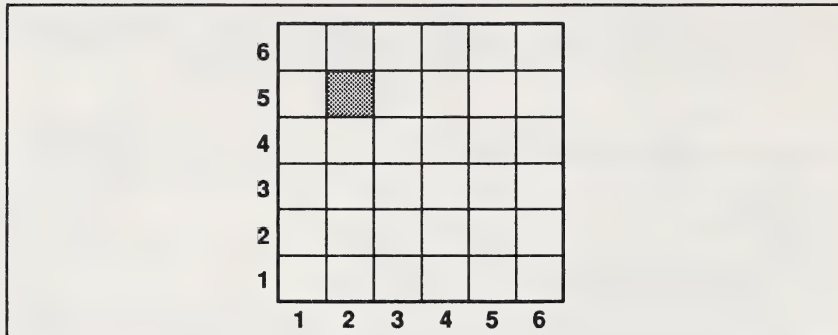
 A d. northern coniferous forest

D. micro-environment

Enrichment

1. How could you use two throws of the dice to pick a square randomly?

Let the first throw tell how far across to go. The next throw can tell how far up. For example, throwing a 2 and then a 5 would correspond to the shaded square shown:



Pick four squares randomly using your dice. Count the birds in each square.

2. Tabulate your results.

The student's answer will depend on the squares picked. The numbers of birds for four squares should be given in a table.

3. Based on the number of birds in the four sample squares, what is your estimate of the total number of birds in the photograph?

The estimate should be equal to nine times the total number of birds in the four squares that were picked. The estimate should be close to 359 – the actual number of birds in the photograph.

4. Report on your research; tell what you found out and where and how you obtained the information.

The student should indicate the source of information used, e.g., from Alberta Conservation and Hunter Education, a book from Alberta Forestry, Lands, and Wildlife, directly from an Alberta wildlife officer, or from a pamphlet (which they should be able to name). The student should also tell whether library research, reading, phoning, listening to a cassette, talking, or some other manner of obtaining information was used.

Deer populations may be estimated using random sampling by helicopter. Statistics based on information from hunters is also used.

Section 2: Interdependencies

Section 2: Activity 1

The following are needed for this activity:

- sheet of thick cardboard measuring about 30 cm by 30 cm
- glue
- pieces of paper for small labels
- coloured pens or pencils
- pins or thumbtacks
- a ruler
- a pair of scissors
- cotton thread of three different colours

1. Refer to the photographs on page 288 of *Science Directions 8*. How do the three organisms obtain their food?

The water lily produces its own food (through photosynthesis). The moose eats aquatic plants. The wolf eats other mammals including some big game.

2. Match the following by placing the capital letters in the appropriate blanks.

<u> B </u>	a. moose	A. producer
<u> C </u>	b. wolf	B. primary consumer
<u> A </u>	c. water lily	C. secondary consumer

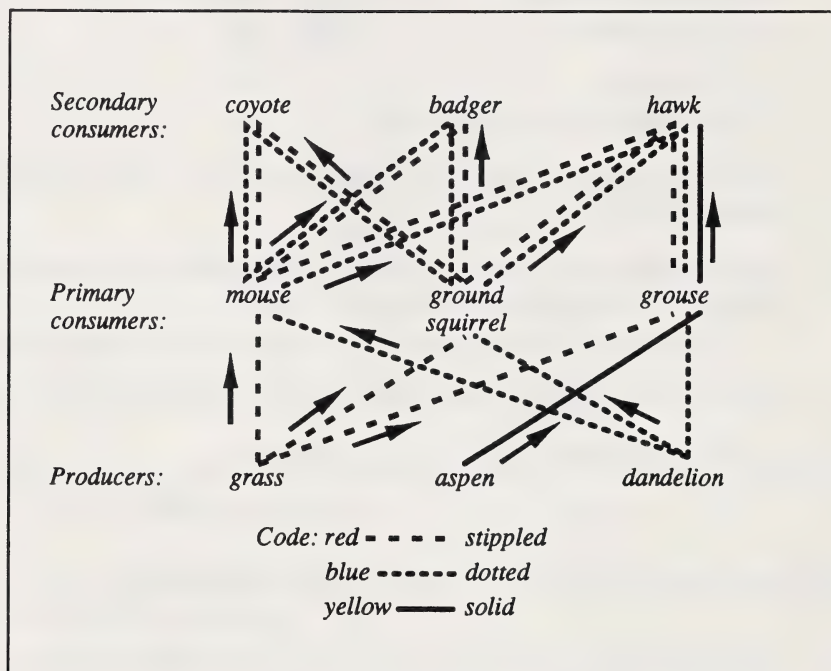
3. An animal that feeds on secondary consumers is called a *tertiary* consumer.
4. Find a food chain having six organisms within the food web on page 291 of your textbook. Show this food chain in the space.

goldenrod → bee → dragonfly → frog → snake → hawk

Comment: For Activity 6-4 of the textbook, it would be desirable, but not essential, that some resources about birds, plants, and mammals of Alberta be available. With resources, students will be able to make more varied food webs.

5. Do step 10 of the Procedure on page 292 of your textbook. Copy the food web in the following space.

Answers will vary depending on the plants and animals chosen from Table 6-1 on page 292 of the textbook. A sample response is shown:



6. Do the following from Finding Out and Finding Out More on page 293 of your textbook.

Textbook question 1:

Producers get their energy from the sun through photosynthesis.

Textbook question 2. (a):

If one of the producers is removed, the primary consumers attached to it would diminish in number. Those primary consumers attached to no other producers (on a complete food web) would die. The secondary consumers attached indirectly to the producer would diminish in number because they would lose some or all of their prey.

Textbook question 2. (b):

If one of the primary consumers were removed, secondary consumers attached to it would diminish in number. Each producer on the same string as the primary consumer would increase in number or become overgrown because fewer animals would feed on it.

Textbook question 2. (c):

If one of the secondary consumers is removed, the primary consumers attached to it would increase in number. The producers attached to these primary consumers could decrease in number due to overgrazing. If the primary consumers become overpopulated, producers could even be decimated.

Textbook question 3:

An animal can be a secondary consumer and a tertiary consumer by feeding on both a primary consumer and a secondary consumer. The following food chains show a hawk as both a tertiary consumer and a secondary consumer:

grain → mouse → snake → hawk

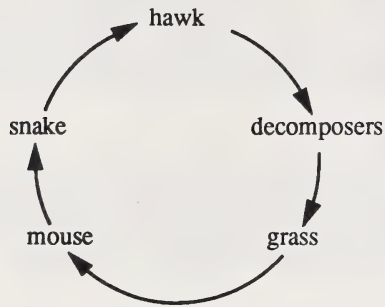
grain → mouse → hawk

Textbook question 4:

The poison could be ingested by mice and enter the tissue of the mice. When the mice are eaten by snakes, the poison enters the snake's tissue. When the hawks eat the snakes, the hawks ingest the poison and the poison enters the tissue of the hawks.

7. Organisms that feed on dead and waste material are called *decomposers*.

8. Draw a cycle involving grass, a mouse, a snake, and a hawk to show how nutrients are recycled.



9. What two microorganisms serve as decomposers?

Bacteria and fungi serve as decomposers.

10. Refer to your food web from question 5 of this activity. Pick one of the producers and assume that it is watered with a chemical that can be traced. Which consumers will have traces of the chemical in their bodies?

All the primary and secondary consumers linked to the producer will have traces of the chemical. The student should list these. Answers will vary since different producers and different food webs will be used.

11. Give three ways other than chemical tracing by which scientists can determine who eats whom.

Scientists can determine food sources by

- *directly observing feeding*
- *looking at stomach contents*
- *examining feces*
- *inferring diet from indirect evidence*

12. Suppose a pack of wolves is seen in the vicinity of a caribou herd over several months. Make an inference: What do the wolves depend on for food?

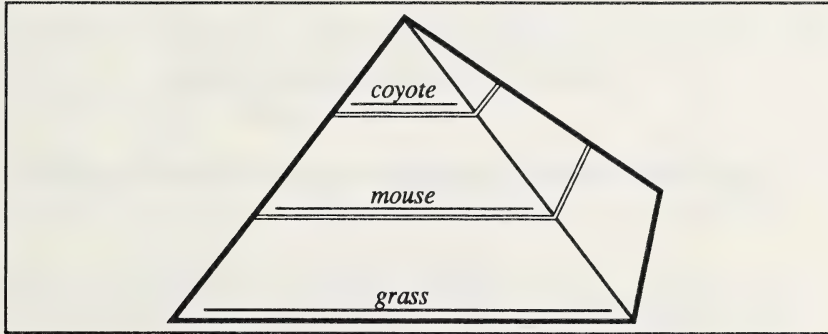
Wolves eat caribou.

Section 2: Activity 2

1. What does a pyramid of numbers show?

A pyramid of numbers shows that in a food chain there are fewer primary consumers than producers, fewer secondary consumers than primary consumers, and so on.

2. Place mouse, coyote, and grass in the correct position on the side of the pyramid to show how population sizes compare in a community.



3. The average mass of a pronghorn is 50 kg. What is the biomass of ninety-five pronghorn antelope? Show your calculations.

The biomass of the pronghorn is $50 \text{ kg} \times 95 = 4750 \text{ kg}$.

4. Calculate the number of wolves for the following food chain:

moss → caribou → wolf

Assume that just 5 percent of the biomass is conserved in going from the primary consumer to the secondary consumer. The caribou population is 800. The average mass of a caribou is 100 kg and the average mass of a wolf is 50 kg.

Caribou biomass is $800 \times 100 \text{ kg} = 80\,000 \text{ kg}$.

Five percent of $80\,000 \text{ kg}$ is $80\,000 \text{ kg} \times \frac{5}{100} = 4000 \text{ kg}$

Therefore, there are $\frac{4000}{50}$ wolves = 80 wolves.

Section 2: Activity 3

1. Match the following symbiotic relationships with their correct definition.

<u> C </u>	a. a relationship in which one species is harmed and the other benefits	A. commensalism
		B. mutualism
<u> B </u>	b. a relationship in which both species benefit	C. parasitism
<u> A </u>	c. a relationship in which one species benefits and the other neither benefits nor is harmed	

2. Commensalism, mutualism, and parasitism are all special kinds of the relationship called *symbiosis*.
3. This question refers to the interactions described earlier. Classify the relationships as commensalism, mutualism, or parasitism. Indicate which relationship benefits, which is harmed, and which is not affected either way.
- a. the birds and zebras
- mutualism*
Both the birds and zebra benefit.
- b. the plovers and crocodiles
- mutualism*
Both the plovers and crocodiles benefit.
- c. the remora fish and sharks
- commensalism*
The remora fish benefits and the shark is neither harmed nor benefited.
- d. the shrimp and fish
- mutualism*
Both the shrimp and fish benefit.

- e. the pine and fungi

mutualism

Both the pine and fungi benefit.

- f. the wasps and other insects

parasitism

The wasps (larvae) benefit but the host insects are harmed.

- 4. Give an example of your own for each of the three kinds of symbiosis. Give reasons for your classification.

Answers will vary. The following are examples.

*Commensalism – the clown fish living within the tentacles of the sea anemone
The clown fish benefits from protection and food provided by the anemone.*

*Mutualism – fungi and algae living together as in lichen
The fungi prevent the algae from drying and the algae provides food for the fungi.*


*Parasitism – rust fungi growing on wheat
The fungi takes nutrients from the wheat. While the fungi benefits, the wheat becomes unhealthy.*

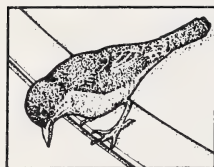
Section 2: Activity 4

- 1. Use the words habitat and niche correctly in the following sentence.

An organism's *niche* is its way of life which allows it to live in a *habitat* along with the rest of the community.

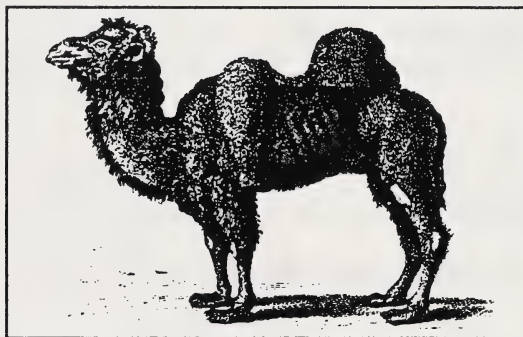
- 2. Describe the niche of the ground squirrel, robin, and pine tree by completing the table.

Organism	How Organism Uses Parts of the Environment	How Organism Is Used by Other Organisms
 ground squirrel	<ul style="list-style-type: none">- feed on grass- dig tunnels for own protection in the soil	<ul style="list-style-type: none">- soil is stirred which allows water and air to penetrate This helps grass to grow.- rattlesnakes use unusual tunnels- is a host for fleas and ticks- is eaten by hawks



Organism	How Organism Uses Parts of the Environment	How Organism Is Used by Other Organisms
robin	<ul style="list-style-type: none"> - use trees for nesting and protection - eat worms and insects - use twigs to build nests - lines nests with grass 	<ul style="list-style-type: none"> - are hosts for fleas and mites which live in the feathers - provide eggs for other birds to eat - are eaten by hawks, snakes
pine tree	<ul style="list-style-type: none"> - use soil for support, water, and nutrients - use decomposers in the soil to provide nutrients - use squirrels to carry seeds 	<ul style="list-style-type: none"> - are producers: provide food for animals, e.g., porcupines, squirrels, birds - provide shelter for animals and other plants - provide organic material for fungus

3. Look at the camel. Identify one specialization that helps it live in the desert.



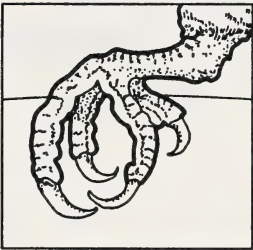
The humps on the camel's back store water.

The specialization allows the camel to live for several days without water as it goes from oasis to oasis.

4. The feet of birds show specialization for different habitats. Infer what the bird feet are adapted for. Match the feet with the descriptions by placing the capital letters in the blanks.
- A. for swimming on water
 - B. for perching in trees
 - C. for walking on grassland

 B a.

This is the claw of a parrot. The toes are curved and directed downward. There are two back toes. The claw is made to grasp branches.



 C b.

This is the flat, webless foot of a pheasant. This type of foot is made for walking on grassland.



 A c.

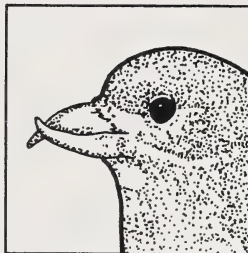
This is the webbed foot of a duck. The webbing gives a better kick in the water.



5. The beaks of birds show specializations related to different consumer niches. Infer for what foods the beaks are adapted. Match the beaks with the foods by placing the capital letters in the blanks.

 B a.

This beak belongs to the crossbill. The beak functions like a screwdriver. The beak is twisted to separate the scales of the cones to expose the seed.



A. nectar from flowers

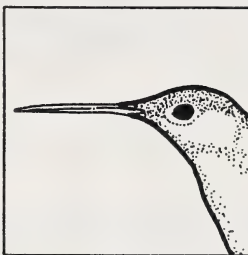
B. pine cone seeds still inside the cones

C. seeds within hard outer coverings

D. mice and other small animals

 A b.

The long beak allows the hummingbird to reach into flowers for nectar.



 D c.

This is a hawk's beak. It is hooked so that it can tear meat.



 C d.

This beak works like a nutcracker. It is short because it must be able to exert a large force. This beak belongs to the parrot.



6. Predict the effects on the organisms in the following situations.

Predictions may vary. Likely consequences are given.

- a. a hawk injures its feet

If the injury to the feet is severe the hawk will not be able to catch and eat its prey. If the injury is permanent the hawk will starve.

- b. a mallard duck gets its bill stuck in a plastic six-pack can holder

The plastic will keep the duck's bill shut. Because the duck cannot eat, it will starve.

- c. a wolf gets its jaw broken in an encounter with a bear

The jaw cannot mend quickly. The wolf will not be able to eat, let alone catch anything, so it will starve.

- d. a porcupine, due to some abnormality, does not grow quills

The porcupine will have nothing to protect itself. It cannot move quickly so it will serve as a prey for coyotes or wolves.

7. A rabbit, which normally changes colour from brown to white in the fall, is still brown when the ground is covered by an unusually early snowstorm. What is the effect on the rabbit?

The rabbit will be very visible especially when it sits very still to avoid being seen. Then a coyote will come straight for it and easily catch it.

8. A fish population moves to deeper water for food. How will birds that feed on the fish be affected?

The birds will have to move to another feeding site.

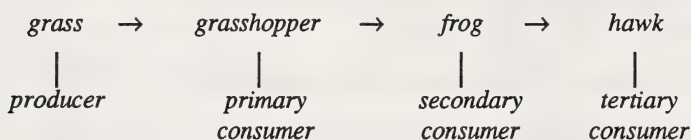
9. The level of a lake rises due to a heavy spring run-off and the sandy beach is covered by 1 m of water. Give your prediction for the birds and plants.

The shore birds will have to find a new habitat or eat from the new shore line. Plants living in the water will flourish and land plants will move back to higher ground.

Section 2: Follow-up Activities

Extra Help

1. Carbon, nitrogen, phosphorus, and calcium are *nutrients* which are needed for the growth and repair of a plant or animal. These substances are returned to the environment by way of special organisms called *decomposers*.
2. Besides nutrients organisms need *energy*, either directly from the sun or from their diet, for growth and activities.
3. Make a food chain involving a frog, a grasshopper, grass, and a hawk. Identify each organism as a producer, primary consumer, secondary consumer, or tertiary consumer.



4. A combination of interconnecting food chains is a *food web*.
5. The three types of symbioses are *commensalism*, *mutualism*, and *parasitism*.
6. Match the following symbiosis with an example from the right hand column.

_____ *b* _____ commensalism

_____ *c* _____ mutualism

_____ *a* _____ parasitism

a. a mistletoe growing on a tree

b. cattle egrets following cattle for the insects that the cattle stir up

c. a lichen

7. What is the biomass of a flock of 150 ducks? The average mass of a duck in the flock is 900 g.

The biomass of the flock is

$$\begin{aligned} 900 \text{ g} \times 150 &= 135\,000 \text{ g} \\ &= 135\,000 \text{ g} \times \frac{1 \text{ kg}}{1000 \text{ g}} = 135 \text{ kg} \end{aligned}$$

8. grass → gopher → badger

In this food chain the badger population is only 10 percent of the gopher population biomass. If the gopher population biomass is 7500 kg, what is the badger population biomass?

The biomass of the badgers is

$$\begin{aligned} 7500 \text{ kg} \times 10\% &= 7500 \text{ kg} \times 0.10 \\ &= 750 \text{ kg} \end{aligned}$$

9. Suppose a skunk lost its scent gland. Predict the effect on the skunk's ability to survive. Give reasons for your conclusion.

Predictions may vary. Likely a scentless skunk will become prey to a coyote or wolf. However, a skunk has sharp claws and powerful front legs so it will not be an easy mark.

10. Moose live in forests. They eat a variety of vegetation; but for the most part they eat new growth from trees and bushes. Predict the effect on the moose population when large areas of forest are cleared.

When forests are cleared, moose lose their habitat; their food supply disappears. The moose population may move to remaining forest or the moose population diminishes. Predictions may vary but should be supported.

Enrichment

Make a food web involving at least ten different types of living things found in the parkland of the prairie provinces. You may have to do some research to find out more about the niches of certain plants and animals. In particular, you'll want to know the feeding habits of the animals.

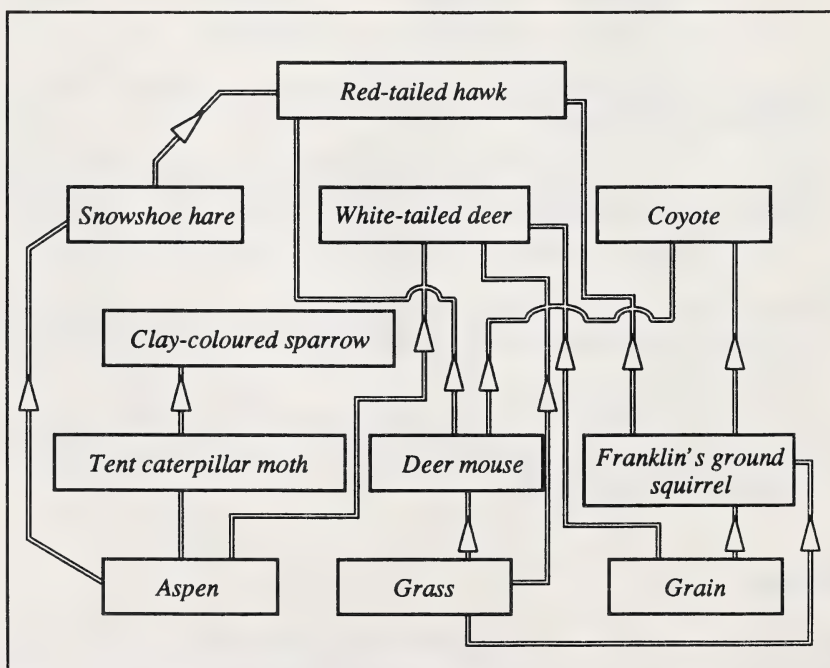
Following is a list of some living things found in the parkland. You may include all or some of the plants and animals listed. You may also include plants and animals of the parkland that you know of but that are not listed.

Tiger swallowtail butterfly
 Black-capped chickadees
 Tent caterpillar
 Coyote
 White-tailed deer
 Bracket fungus
 Snowshoe hare
 Red-tailed hawk
 Black-billed magpie
 Mosquito
 Poplar sphinx moth

Deer mouse
 Saw-whet owl
 Prickly rose
 Mashed shrew
 Clay-coloured sparrow
 Franklin's ground squirrel
 Richardson's ground squirrel
 Red-eyed vireos
 Meadow vole
 Yellow warbler
 Short-tailed weasel

This Enrichment is similar to making the food web in Activity 1 of this section. However, here the students are encouraged to make a more complex food web using more organisms of their choice based on research of the inhabitants of the parkland.

Answers will vary depending on the living things used. A sample response may be as follows:



Section 3: The Environment and Human Activities

Section 3: Activity 1

You may want to conduct a field trip to a slough. On such a field trip students could observe

- the size and shape of the slough
- the surrounding habitat of the slough
- the slope of the land surrounding the slough
- a sample of slough water
- the plants and animals of the slough, e.g., bulrushes, ducks, kildeer, red-winged blackbirds

If you conduct a field trip be sure to discuss safety concerns. Also mention that observations should be made with minimal impact on the slough habitat.

1. What is the question you will be answering?

What are some of the interactions in a prairie slough ecosystem?

2. Do questions 1 to 6 from Finding Out on page 314 of your textbook.

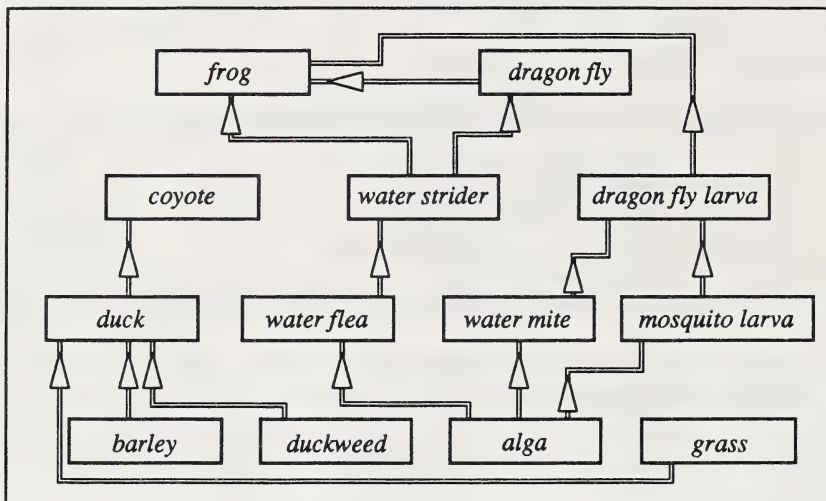
Textbook question 1:

The precipitation and run-off from the surrounding slopes provide the water for the slough. If the precipitation is limited, the slough may dry up temporarily, plants may die, and animals may move. The quantity of water affects the amount of plant and animal life.

Textbook question 2:

Answers will vary. With research, the student will be able to select a wide variety of organisms connected in many ways.

One response is the following:



Textbook question 3:

Mallards and coots use the shore vegetation for shelter. Blackbirds perch on bulrushes. Curlews and kildeer nest among the blades of grass. Muskrats use water plants for bedding.

Textbook question 4:

The water snail eats plants and algae. This keeps vegetation under control so that sunlight can pass through the water. The water snail serves as a food source for curlews and kildeer.

Textbook question 5:

This is a question to stimulate thinking and answers will vary.

Sloughs dry up occasionally so fish cannot live in them. Sloughs can be used for raising fish but only the deeper sloughs that do not freeze up completely can be used. Water may have to be supplied and the fish may have to be fed. In some sloughs, due to the decaying plant matter, the oxygen content of the water is too low to support fish.

Textbook question 6:

Water striders prey on the water fleas, which are primary producers. The pyramid of numbers for food chains suggests that the water fleas will be more numerous.

3. Do questions 7 and 8 from Finding Out More on page 314 of your textbook.

Textbook question 7:

The bullfrog is affected more than other frogs by occasional drying-up of sloughs because of its long tadpole phase. With sloughs drying up, the tadpole cannot be supported long enough for the bullfrog to reach adulthood.

Blackflies lay their eggs in running water. Slough water is stagnant.

Textbook question 8. (a):

Farmers have drained or covered sloughs for more cropland and pasture. Maybe there was a change in climate with less precipitation to feed the sloughs. Also, as sloughs age, soil particles from spring run-off and decaying plants and algae fall to the slough bottom. With this build-up the sloughs become increasingly shallow and eventually the open water disappears.

Textbook question 8. (b):

A slough provides a habitat for ducks. When a slough disappears, its ducks must compete for nesting, brooding, and feeding at other sloughs. When a large number of sloughs disappear, the duck population of the prairies decreases as well.

Section 3: Activity 2

1. Name four human occupations that provide foods or materials.

Answers may vary. The human occupations given in the reading are farming, logging, mining, and fishing.

2. The development of *technologies* allows people to change the environment on a much larger scale than before.
3. What is the question you will find the answer to?

What effect does the food pyramid/chain have on the build-up of pesticides? or the question can be quoted from the Problem.

4. Do questions 1 to 5 of Finding Out on page 317 of your textbook.

Textbook question 1:

earthworm → robin → hawk

Textbook question 2:

$$\frac{1 \text{ unit}}{1 \text{ worm}} \times \frac{5 \text{ worms}}{1 \text{ day}} \times \frac{7 \text{ days}}{1 \text{ week}} \times 6 \text{ weeks} = 210 \text{ units}$$

earthworm → *robin* (210) → *hawk*

Textbook question 3:

$$\frac{210 \text{ units}}{1 \text{ robin}} \times 12 \text{ robins} = 2520 \text{ units}$$

earthworm → *robin* (210) → *hawk* (2520)

Textbook question 4:

The DDT has increased by a factor of 2520.

Textbook question 5:

The DDT will become available to producers when the hawk's body is broken down by decomposers. Or, DDT may enter the body of an animal that scavenges on the hawk. In any case, since DDT is a stable chemical, it will remain in the environment.

5. Do question 6 of Finding Out More on page 317 of your textbook.

Textbook question 6. (a):

Predictions may vary. The insect population will initially increase since the population of one of its predators has been reduced. Once the poison takes effect the insect population will diminish.

Textbook question 6. (b):

A pesticide may reduce a natural predator population of the target insect pest. The loss of a predator may have a greater effect than the direct effect of the pesticide on the unwanted insect. The result would be an increase in the population of the insect pest.

6. What evidence is there that even remote parts of the biosphere are affected by pollutants?

DDT is found in the penguins of the Antarctic.

Section 3: Activity 3

The following are needed for this activity:

- sandwich bags or plastic kitchen wrap
- slices of bread
- a dust cloth
- four plates or soup bowls
- toothpicks
- paper towels

The student should continue to work on the section while waiting for the bread moulds to start growing.

Be sure to have all moulds disposed of as soon as the experiment is completed.

The student should wash up after handling the plates or bread. Do not allow the student to stand over the moulds breathing them in over a prolonged period.

For questions 1 to 5 sample student responses are provided. Answers may vary depending on the observations made.

1. When did you first notice mould growing? On which plate was it? Are there any similarities between the moulds or are they totally different on each piece of bread?

I first noticed moulds growing on both pieces of bread after 2 days. The moulds were of a couple of different colours on both plates. The size initially was fairly small. The moulds looked similar on both pieces of bread.

2. Why did you puncture holes in the plastic wrap and moisten the paper towels?

I punctured holes to allow the moulds to have air. The towels were moistened to provide another abiotic need for the mould.

3. Why did you transfer similar moulds to the new plates?

The reason I used the similar moulds was to try and match them so that the results would be more comparable.

4. After seeing your results in the experiment, how do you think a chemical pesticide answers people's needs?

I don't think that pesticides really meet people's needs, at least in many uses. I think it's the easy route to go.

5. Based on your awareness of food chains, do you think that people should manage crops over a long period of time using only chemical poisons?

Large amounts of pesticides will continue to pollute the environment and contaminate the inhabitants. People are taking a chance of damaging the food webs permanently. Also, the target of the pesticide may develop some resistance after a number of applications.

Section 3: Activity 4

1. Who says that a flower threatens Alberta wetlands?

The organization Ducks Unlimited claims that a flower threatens Alberta wetlands.

2. Name the plant that threatens wetlands.

Purple loosestrife or lythrum threatens the wetlands.

3. How was this plant introduced to North America?

Purple loosestrife was brought over from Europe as an ornamental garden flower.

4. In what way does purple loosestrife pose a danger to natural plants and animals?

Purple loosestrife grows almost out of control in wetlands. It displaces slough plants such as bulrushes and continues growing until it covers the water completely. Then habitat for ducks, muskrats, and beaver is lost.

5. What may Alberta Agriculture do to deal with this problem?

Alberta Agriculture may declare purple loosestrife to be a noxious weed.

6. What would Ducks Unlimited like to see done to overcome the problem of purple loosestrife?

Ducks Unlimited would like to have purple loosestrife banned completely.

7. What do you think should be done about purple loosestrife?

Answers will vary. Some students may want to place a total ban on purple loosestrife and kill all purple loosestrife now growing in the wild. The fact that purple loosestrife has destroyed marshes in other provinces supports this position. Others may allow people to cultivate the plant but would be satisfied to have it treated as a noxious weed. Some students may want more information on which to base a decision.

8. What would you do with purple loosestrife if you had some in your garden?

Answers will vary. Some would remove and destroy it to prevent even accidental cross-pollination. Others would just make sure that it remained confined to the garden.

9. Predict what would happen to the local rabbit population if foxes, wolves, and coyotes were removed from the rabbit habitat?

The rabbit population would increase because none would be killed by predators.

10. For their diet, sparrows depend to a large degree on spilled grain and garbage left out in the open – an artificial food supply. What do you predict will happen to the swallow and bluebird populations if grain is kept in well-closed granaries and garbage is put in covered containers?

Less food will be available for sparrows. The sparrow population will decrease. Fewer swallow and bluebird nests will be upset so these birds will reproduce more effectively. Therefore, the swallow and bluebird populations will increase.

11. Imagine the following: Several farmers in a region have lost some chickens to hawks. In an effort to prevent more chickens from being taken, these farmers band together to kill all the hawks and destroy all their nests in the region. After all the hawks are gone the mouse population increases to such an extent that mice can be seen everywhere scurrying around – especially in the grain fields. The farmers also see a change in the number of grasshoppers.

- a. Explain the mouse plague.

Hawks prey on mice; normally they help control mice populations in farm areas. Without mice being eaten by hawks, more of them survive to have more young. Therefore, without the hawk, the mouse population is larger.

- b. Predict the change in the grasshopper population. Will it increase or decrease?

The grasshopper population will increase because grasshoppers are normally eaten by hawks.

12. Match the following by placing the appropriate capital letter in each blank.

<u> B </u>	a. auk	A. extinct due to loss of habitat
<u> C </u>	b. bison	B. extinct due to overhunting
<u> D </u>	c. extinct	C. extirpated due to overhunting
<u> A </u>	d. passenger pigeon	D. means no longer existing

13. Most of the extinctions of species occurs today because of *loss of habitat*.
14. Suppose you were talking to someone who had not developed much interest in plants and animals. What could you say to this person to explain why human beings should be concerned about the extinction of species?

Answers may vary but should include the idea that people's environment changes due to the disappearance of species. The more species that disappear, the more the environment changes. These changes could result in an environment unable to support human life.

15. Name two sources of air pollutants.

The burning of fuel, such as gasoline and coal, and farmers' chemical spraying are sources of air pollutants.

16. List three sources of air pollutants where you live.

Answers will vary. Some sources of pollutants are: oil refineries, farmer's spraying fields, automobiles, tractors, alfalfa pellet plants, feed mills, electric power generating plants, home furnaces.

17. How does conserving paper help the environment?

Conserving paper reduces the need for logging and reduces the pollution involved with burying or burning the waste paper.

Section 3: Follow-up Activities

Extra Help

1. Make a food chain with the following:

- alga
- dragonfly larva
- frog
- snake
- water mite

alga → water mite → dragonfly larva → frog → snake

2. Pesticides *increase* as you go up the food chain.
3. Which experiment did you do to demonstrate the development of resistance in a population?

The mould-growing experiment in Activity 3 demonstrated the development of resistance.

4. Name some organisms that people brought to a new place which later on caused problems.

The sparrow, rabbit, purple loosestrife, and Eurasian milfoil are some organisms that caused problems in their new home.

5. Suppose that this food chain is found in a lake.

alga → fairy shrimp → minnow → perch → pike

The perch is extensively fished so that the perch population decreases.

- a. What happens to the pike population?

The pike population goes down because the pike have less to feed on.

- b. What happens to the minnow population?

The minnow population increases because fewer are eaten by the perch.

6. Name an organism which became extinct due to overhunting.

The auk became extinct due to over-hunting.

7. What is the most common reason for the extinction of species?

Loss of habitat is the main cause of extinction.

8. You know that many human activities have resulted in a decrease in the quality of the environment. Why can you still be optimistic about the future of the environment?

Answers can be expressed in different ways. The following is one response:

People are becoming more aware of environmental problems and concern about the environment is growing. This is shown by the following: DDT has been banned, paper is recycled, sewage is treated, lead-free gasoline is used, and energy is conserved.

Enrichment

You have come to know that plant and animal species have become extirpated and even extinct as a result of human activities. You will write an article about a species that has been severely affected by human activities. Some choices are the peregrine falcon, black-footed ferret, or ivory-billed woodpecker.

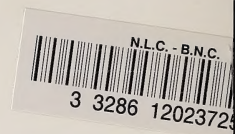
Do Activity 6-6 on page 300 of *Science Directions 8*.

The student may want to review Endangered Species on pages 298 to 300 of the textbook. The reference book Endangered Spaces by Monte Hummel is recommended as a resource. Among the resources, there may be some difference of view about whether a species is endangered or not – you may want to relate this to the student.

Answers will vary. The article should indicate, for the species chosen,

- *the reason for its disappearance (extinction)*
- *the extent of its disappearance in terms of population or range reduction*
- *its normal habitat and niche*
- *the effect of its disappearance on other organisms and on humans*





This booklet cannot be purchased separately;
the Student Support Guide is not available
as an individual item.

